North Carolina.—Hatteras, 1st; Charlotte, 2d; Wilmington, 2d, 4th; New River Inlet, 2d, 12th, 29th; Weldon, 3d; Smithville, 12th; Stateville, 20th; Raleigh, 29th.

Ohio.—Cleveland, Garrettsville, and Napoleon, 3d, 27th; Toledo and Wauseon, 18th; College Hill, 21st, 29th; Cincinnati, Jacksonborough, Hiram, North Lewisburg, Tiffin, Westerville, and Yellow Springs, 27th.

Oregon.—East Portland, 9th; Portland, 10th.

Pennsylvania.—Wellsborough, 2d; Dyberry, 3d; Fallsington, 3d, 4th, 29th, Chambersburg, 3d, 13th; Erie, 3d, 27th; Grampian Hills and Pittsburg, 13th; Philadelphia and South Bethlehem, 29th.

Rhode Island.—Block Island, Narragansett Pier, and Point Judith, 3d.

South Carolina.—Kirkwood and Stateburg, 2d, 3d; Spartanburg, 2d, 3d, 20th; Pacolet, 20th.

Tennessee.—Memphis, Milan, and Nashville, 1st; Chattanooga, 1st, 28th, 29th; Ashwood and Knoxville, 3d and 28th; Austin, 13th.

Texas.—El Paso, 1st, 10th; New Ulm, 2d, 18th, 25th; Indianola, 11th; San Antonio, 11th, 18th; Brownsville, 12th; Fort Stockton, 17th; Palestine, 18th; Abilene, 18th, 24th; Galveston, 18th, 25th, 31st; Cleburne, 24th.

Utah.—Frisco, 8th; Salt Lake City, 9th, 10th.

Vermont.—Brattleborough, Lunenburg, Newport, and Strafford, 4th; Woodstock, 4th, 21st; Charlotte, 14th.

Virginia.—Fort Myer, 2d, 3d, 13th, 29th; Bird's Nest, 2d, 3d, 21st, 29th; Dale Enterprise, 3d, 8th, 29th; Cape Henry, Chincoteague, and Norfolk, 3d, 29th; Blacksburg, Lynchburg, and Variety Mills, 29th; Snowville, 30th.

Washington Territory.—Pysht, 29th; Neah Bay, 29th, 30th.

Wisconsin.—Manitowoc, 24th.

Wyoming.—Fort Bridger, 9th.

The following notes on the probable connection between the occurrence of thunder-storms at special stages of the tide, have been prepared by Junior Prof. H. A. Hazen, of the Signal Office:

A frequent inquiry is made as to whether the tides in any way can influence the occurrence of thunder-storms. In general, it is much safer to first determine how such influence can be possible and afterward to determine its amount and detailed action by actual observation. There are many cases, however, in which we may be able to establish certain facts pointing to interdependence between two phenomena, although there may be no apparent connection. Great care must be taken in the latter case that we do not insist on the connection, except as supported by the clearest proofs. For example, there is a well-nigh universal belief that there is an intimate connection between different phases of the moon and the weather. The reason for this is, in part, that during any particular phase all kinds of weather are experienced, and those who hold one view only consider the weather that coincides with their views, while a complete study would show that after all there is but little difference between the weather at different phases. Attempts have already been made to prove a connection between thunder-storms and the moon; it is evident that, since the moon is the principal cause of the tides, if such connection could be established we would have a partial proof of the point now under discussion. Doctor Köppen, of Germany, has published an investigation of the moon's influence upon thunder-storms, and the writer has made a study of the same from the very complete records of the Signal Service for 1884. The following table exhibits the results side by side:

Moon's Phase.	Dr. Köppen.		Signal Service.	
	No. of storms.	Per cent.	No. of storms.	Per cent.
New	336	25.2	3,538	29.5
First quarter	406	30.5	3,232	27.0
Full	270	20.3	2,930	24.4
Last quarter	321	24.1	2,296	19.1
Total	1,333	100.1	11,996	100.0

These results are quite accordant, and show a slight predominance in the number of storms during new moon and first quarter above the other two phases. The amount of the effect it will be seen, however, is extremely slight. Turning to the subject in hand, we find many well-educated people residing along the Atlantic coast who believe that no severe thunder-storm will occur in their neighborhood during a falling tide. This belief has been recently communicated to this office by Mr. S. B. Strong, the voluntary observer at Setauket, New York. There seemed to be sufficient reason for entering upon an investigation, even though no relationship between the phenomena could be premised from general laws. There are many serious difficulties in the way of such an investigation.

1st. The storms themselves are not always well and sharply defined occurrences.

2d. It is not easy to get the moment of most intense action during the progress of the storm or any other moment in the life of a storm which will enable us to make a rigid comparison between one and another.

3d. We cannot easily determine whether we are at the centre or on the edge of a storm.

4th. The question of the place where we shall take the tide is an intricate one, though it will be safer at the outset to take the tide on promontories rather than at the head of bays or up large rivers.

With the above conditions in mind, 197 storms along the Atlantic coast from Savannah, Georgia, to Portland, Maine, have been taken, without selection, and studied in connection with rising and falling tide. Three divisions have been made; in the first were placed all storms which occurred on the rising tide, in the second all storms which lasted over from the rising tide or occurred very near the highest point, in the third all storms that occurred on a falling tide. Out of these 197 storms 111, or 56 per cent., were in the first division, 57, or 29 per cent., were in the second, and 29, or 15 per cent., were in the third. Considering half the storms in the second division as belonging to the first we have 70.5 per cent. occurring on the rising tide as against 29.5 per cent. on the falling. This is a rather remarkable result and needs corroboration by more observations, and by extending the discussion to other countries. The results would seem to be worthy of a much more exhaustive study. It is very plain that the question of a connection between thunder-storms and the tides does not stop at the sea-coast. We ought to obtain answers to question like the following:

Is there a direct effect from the tide on the storm?

Is there a force acting upon both?

Is the influence at the coast alone?

Can we find any general law connecting the occurrence of thunder-storms inland with those on the coasts?

We may go still farther. Since it has been fairly well established that our more severe thunder-storms occur in the southeast quadrant of low areas, may we not be enabled to correlate the development and progress of our more general storm-actions with some general law not yet fully discovered?

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various states and territories, as follows:

Alabama.—1st.

Arizona.—7th, 20th.

California.—12th, 15th, 22d, 23d, 25th, 26th.

Colorado.—5th, 13th, 26th.

Connecticut.—12th.

Dakota.—2d, 12th, 31st.

Florida.—26th, 27th.

Georgia.—8th, 10th, 19th, 27th.

Idaho.—13th.

Illinois.—11th, 14th, 15th, 17th, 18th, 26th, 27th.

Indiana.—15th, 18th.

Iowa.—3d, 4th, 10th, 11th, 17th, 24th, 26th, 29th.

Kansas.—26th.

Kentucky.—11th.

Maine.—13th, 31st.

Michigan.—10th, 11th, 12th, 14th, 17th, 18th, 27th.

Missouri.—15th.

Montana.—4th, 5th, 12th, 16th.

Nevada.—11th, 13th, 15th, 25th.

New Jersey.—12th, 19th.

New York.—12th, 13th, 16th, 18th.

North Carolina.—20th, 28th.

Ohio.—7th, 12th, 15th, 17th, 18th, 20th, 24th to 27th.

Pennsylvania.—10th, 12th, 18th, 19th, 30th.

Rhode Island.—12th, 20th.

South Carolina.—8th, 10th, 19th, 20th, 25th, 29th.

Tennessee.—7th, 11th, 15th, 18th, 27th, 30th.

Texas.—6th, 31st.

Utah.—11th.

Virginia.—11th, 18th, 19th, 26th, 28th.

Washington Territory.—11th, 12th, 16th.

Wisconsin.—12th, 17th, 18th, 24th.

Wyoming.—5th, 8th, 9th, 13th, 14th, 16th, 17th, 24th to 28th.

LUNAR HALOS.

Lunar halos were observed in the various states and territories, as follows:

California.—12th, 14th, 24th.
Colorado.—14th.
Connecticut.—19th, 30th.
Dakota.—12th, 14th, 18th, 20th, 21st, 24th, 25th, 26th, 30th.
District of Columbia.—19th.
Florida.—15th to 25th.
Georgia.—15th, 16th, 18th.
Idaho.—24th, 26th.
Illinois.—14th, 16th, 17th, 24th, 26th, 30th.
Indiana.—14th, 18th, 24th to 27th.
Iowa.—2d, 16th, 17th, 25th, 26th, 29th.
Kansas.—17th, 23d, 25th, 28th.
Kentucky.—15th, 17th, 18th.
Maine.—20th, 26th.
Massachusetts.—12th, 18th, 27th.
Michigan.—14th, 18th, 24th, 25th, 26th.
Minnesota.—20th, 25th.
Montana.—21st, 24th, 25th.
Nebraska.—14th to 18th, 20th, 21st, 23d, 25th, 26th.
Nevada.—14th, 16th, 23d, 28th.
New Hampshire.—26th.
New Jersey.—11th, 19th, 28th.
New York.—18th, 22d, 23d, 27th.
Ohio.—4th, 11th, 17th, 18th, 22d, 26th, 27th.
Oregon.—4th, 13th, 23d.
Pennsylvania.—19th, 21st, 22d, 23d, 24th, 28th.
Rhode Island.—12th, 18th, 19th.
South Carolina.—12th, 15th, 19th, 27th.
Tennessee.—18th, 24th, 25th.
Texas.—14th to 17th, 19th to 23d, 25th.
Utah.—14th, 24th.
Vermont.—17th, 26th.
Virginia.—1st, 20th, 23d, 26th, 28th, 30th.
Washington Territory.—2d, 16th, 17th, 27th, 28th.
Wisconsin.—14th, 18th, 24th, 28th.
Wyoming.—13th, 16th, 19th, 24th, 29th.

The phases of the moon during October were: last quarter, 1st, 6.23 a. m.; new moon, 8th, 2.25 a. m.; first quarter, 15th, 8.14 p. m.; full moon, 23d, 4.16 a. m.; last quarter, 30th, 12.52 a. m.; perigee, 3d, 6 p. m.; apogee, 16th, 12.18 a. m.; perigee, 28th, 2.36 p. m.

MIRAGE.

Mirages were observed during the month at the following places:

Webster, Dakota, 6th, 16th.
Salina, Kansas, 15th, 16th, 22d, 25th.
Saint Vincent, Minnesota, 13th.
Marquette, Nebraska, 14th, 15th.
Harvard, Nebraska, 15th.
Riedsville, North Carolina, 5th.
Indianola, Texas, 28th, 29th.

MISCELLANEOUS PHENOMENA.

SUN SPOTS.

Prof. David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for October, 1885:

Date—October, 1885.	No. of new.		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
4, 11 a. m.	.....	.....	.....	.....	.....	.....	4	25‡	
7, 9 a. m.	.....	.....	0	0	.....	.....	4	30‡	
9, 12 m.	0	0	0	0	0	0	4	25‡	
11, 10 a. m.	0	0	0	0	0	0	4	20‡	
12, 11 a. m.	0	0	0	5‡	0	0	3	12‡	
14, 4 p. m.	0	0	.....	.....	0	0	0	0	
16, 1 p. m.	1	2	0	0	1	2	1	2	
18, 3 p. m.	3	35‡	0	0	.....	.....	4	40‡	
22, 9 a. m.	2	30‡	.....	.....	.....	.....	3	65‡	
23, 2 p. m.	1	15‡	0	0	0	0	4	80‡	
24, 2 p. m.	2	20‡	1	3	1	5	5	95‡	
25, 4 p. m.	2	20‡	0	0	1	15‡	7	115‡	

Faculæ were seen at the time of every observation. ‡ Approximated.

Professor Carpenter, of the Michigan State Agricultural College, of Lansing, reports sun spots during the month of October, as follows:

1st, five groups, twelve spots; 9th, 11.15 a. m., four groups, twenty-three spots; 10th, 11.15 a. m., three groups, forty spots; 14th, 1.15 p. m., none observed; 15th, three groups, twelve spots; 20th, 3.30 p. m., four groups, thirty-five spots; 22d, 2.50 p. m., three groups, forty-two spots; 24th, — p. m., seven groups, fifty-eight spots.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and seventy-one stations show 5,254 observations to have been made, of which three were reported doubtful; of the remainder, 5,251, there were 4,724, or 90.0 per cent., followed by the expected weather.

DROUGHT.

Wysox, Bradford county, Pennsylvania: the wells and streams in this vicinity, during the first and second decades of the month, were almost dry, but the heavy rains of the latter part of the month relieved the drought.

Fallsington, Bucks county, Pennsylvania, 31st: many wells in this vicinity were dry during the month.

Lead Hill, Boone county, Arkansas, 31st: the small streams in this part of the state have dried up or become so low that the supply of water for stock is very poor. The soil is so hard, from the continued drought, that the seeding of wheat has been much retarded.

Indianola, Texas: reports from the surrounding country on the 26th stated that gardens were suffering in consequence of drought.

Tucson, Arizona: pasturage is very poor and the supply of water for stock very limited at the close of the month.

Fort Grant, Arizona: at the end of the month severe drought prevailed in this part of the territory. Streams have dried up and stock has suffered much on account of scarcity of water. Water for domestic uses is hauled a distance of two miles.

EARTHQUAKES.

Variety Mills, Nelson county, Virginia: at 11.36 p. m. on the 9th a sharp shock of earthquake was felt at this place. It was accompanied by a rumbling noise, resembling thunder, which gradually died away. A second, but much less noticeable, shock occurred about one hour later.

Dale Enterprise, Rockingham county, Virginia, 9th: a slight shock, which is supposed to have been due to an earthquake, was felt in this and Augusta counties at 11.35 p. m. The earth trembled, and a strange, cracking noise was heard at the time of the shock.

Lynchburg, Virginia: during the night of the 9–10th two slight but distinct shocks of earthquake were felt here. The first shock occurred at 11.35 p. m., and the second at 12.40 a. m. The shocks were preceded by a rumbling noise which seemed to come from the northeast; they were sufficient to cause window-panes to rattle.

Petersburg, Virginia: three distinct shocks of earthquake were felt in this city between 11 p. m. and midnight of the 9th. Each shock was preceded by a rumbling sound, sufficiently loud to cause considerable alarm. Windows were shaken and furniture was displaced by the shocks.

Staunton, Virginia: a distinct shock of earthquake, lasting about thirty seconds, was felt here at 11.40 p. m. on the 9th.

Richmond, Virginia: an earthquake shock was felt in certain parts of the city during the night of the 9–10th. The vibrations were very slight.

The following is an extract from the Washington "Evening Star" of October 10, 1885:

An earthquake shock is reported to have occurred in this city near midnight last night. A gentleman, living on N street, near 12th, states that while reading in his library at 11.42 o'clock he felt a clearly-defined earthquake, the tremor continuing from ten to twenty seconds.

At the Signal Office the observers did not notice any shock, nor did the